

CLAIMS

1. A back illuminated photodetector comprising:
 - a first conductive type semiconductor substrate;
 - 5 a second conductive type impurity semiconductor region provided in the first superficial surface layer of the semiconductor substrate;
 - a recessed portion for incidence of to-be-detected light formed in the second surface of the semiconductor substrate and in an area opposite the impurity semiconductor region; and
- 10 a window plate bonded to the outer edge portion of the recessed portion in such a manner as to cover the recessed portion to transmit the to-be-detected light.
2. The back illuminated photodetector according to Claim 1, further comprising a supporting film provided on the first surface of the semiconductor substrate to support the semiconductor substrate.
- 15 3. The back illuminated photodetector according to Claim 2, further comprising a filling electrode penetrating through the supporting film and connected electrically to the impurity semiconductor region at one end thereof.
- 20 4. The back illuminated photodetector according to any one of Claims 1 to 3, wherein the window plate is made of an optically transparent material and is bonded to the outer edge portion by anodic bonding.
- 25 5. The back illuminated photodetector according to Claim 4, wherein the optically transparent material is quartz, and wherein the window plate is bonded to the outer edge portion via a member

containing alkali metal.

6. The back illuminated photodetector according to any one of Claims 1 to 5, wherein the window plate is bonded to the outer edge portion via a metal layer.

5 7. The back illuminated photodetector according to any one of Claims 1 to 6, wherein a stepped portion is formed in a side surface of the semiconductor substrate or in a side surface of the window plate.

10 8. The back illuminated photodetector according to any one of Claims 1 to 7, wherein a highly-doped impurity semiconductor layer with impurities of the first conductive type added thereto at a high concentration is provided in the second superficial surface layer in the outer edge portion of the semiconductor substrate.

15 9. The back illuminated photodetector according to any one of Claims 1 to 8, wherein a highly-doped impurity semiconductor layer with impurities of the first conductive type added thereto at a high concentration is provided in the bottom portion of the recessed portion within the second superficial surface layer of the semiconductor substrate.

20 10. The back illuminated photodetector according to any one of Claims 1 to 9, wherein a highly-doped impurity semiconductor region with impurities of the first conductive type added thereto at a high concentration is exposed across the entire side surface of the semiconductor substrate.

25 11. The back illuminated photodetector according to any one of Claims 1 to 10, wherein the window plate has a square cross-sectional shape with at least one corner being chamfered in a plane perpendicular

to the thickness direction thereof.

12. A method for manufacturing a back illuminated photodetector comprising:

5 a impurity semiconductor region forming step of forming a second conductive type impurity semiconductor region in the first superficial surface layer of a first conductive type semiconductor substrate;

10 a recessed portion forming step of forming a recessed portion for incidence of to-be-detected light in the second surface of the semiconductor substrate and in an area opposite the impurity semiconductor region; and

15 a window plate bonding step of bonding a window plate for transmitting the to-be-detected light to the outer edge portion of the recessed portion in such a manner as to cover the recessed portion.

13. The method for manufacturing a back illuminated photodetector according to Claim 12, wherein the window plate is made of an optically transparent material, and wherein in the window plate bonding step, the window plate is bonded to the outer edge portion by anodic bonding.

20 14. The method for manufacturing a back illuminated photodetector according to Claim 12, wherein in the window plate bonding step, the window plate is bonded to the outer edge portion via a metal layer.

25 15. The method for manufacturing a back illuminated photodetector according to any one of Claims 12 to 14, wherein in the impurity semiconductor region forming step, a plurality

of the impurity semiconductor regions are formed;

in the recessed portion forming step, a plurality of the recessed portions are formed, respectively, for the plurality of impurity semiconductor regions; and

5 in the window plate bonding step, the window plate is bonded to the outer edge portion in such a manner as to cover the plurality of recessed portions,

the method further comprising a dicing step of performing a plurality of dicing steps from the first surface of the semiconductor substrate to the surface of the window plate so that a plurality of pairs of 10 the impurity semiconductor regions and the recessed portions provided opposite the respective impurity semiconductor regions are divided into respective pairs.